

Flow regime variability in snow avalanches

Anselm Köhler (1), Betty Sovilla (1), and Jim McElwaine (2)

(1) Institut für Schnee- und Lawinenforschung SLF, Davos Dorf, Switzerland (anselm.koehler@slf.ch), (2) Department of Earth Sciences, Durham University, Durham, UK

Seventy-seven snow avalanches have been successfully recorded with the GEODAR radar system in the Vallée de la Sionne avalanche test-site during the last five years. This data set includes a wide variety of avalanche types from warm to cold, wet to dry, small to large and from purely dense flows to fully developed powder snow avalanches. These difference can be between avalanches as is well known, but they can also occur within the same avalanche.

The data from single events show many interesting flow features such as surges, hydraulic shocks, and a variety of stopping behaviours. We identify the stopping signature as the main difference between warm and cold avalanches. While warm flows often stop with a backward propagating shocks or even instantaneously, with cold flows the nose continues furthest while the avalanche starves behind.

Warm avalanches can be further divided into shear flow and plug flow, and often there is a transition form one to the other. Cold avalanches can be purely dense flows but can also give rise to a frontal intermittent region which characterizes fully developed powder snow avalanches. Which flow regime is taken is not only defined by the properties of the released and entrained snow, as for example cohesion, but also by the flow bed, the terrain and the size.

This unique data set is a valuable source for model calibration and refinement including the full variability of flow regimes.